

duced by means of either X-ray or radium produces an amenorrhea and is associated with the usual menopausal changes. The nervous manifestations, however, are, as a rule, less prolonged and less severe than the normal or following radical surgical procedure.

Radium or X-ray is contra-indicated in the presence of acute or subacute pelvis infection. On the other hand, radiological methods are particularly appropriate in cases of severe tuberculosis or other local or constitutional diseases that would render the individual a poor surgical risk.

Because of the safety and simplicity of sterilization by radiological methods, this procedure is to be preferred to surgical means in all cases excepting those in which abdominal surgery may be indicated for the correction of some existing pathological condition, acute pelvis infection or in young women where menopausal changes are not desired.

Lay Advertising and Child Welfare—Under this heading, Frank V. Bogert (N. Y. State Journal of Medicine) says: "Never has the danger of a little knowledge been more prettily demonstrated than in the matter of public education in regard to diet. Producers of proprietary foodstuffs, in exploiting their wares, have reached a point so close to the limits of honesty that their pernicious teachings must be reckoned with in the promotion of public health. More especially does this concern the worker among children, who, dealing with the more delicate digestive apparatus of the young, an apparatus which must be protected and developed for the future, also deals with a group more vulnerable to temptation and managed dietetically by overzealous guardians. To the average mother, today, the one important consideration is to obtain the ingestion of sufficient calories, vitamins, iron, and salts by tempting, urging, coaxing, and force without regard to needs and ability to assimilate. The intemperate prohibitionist likes to believe that one can't eat too much. Weight is too often made the standard of health and the undernourishment of overfeeding is treated by more food. . . .

Every pernicious dietetic habit that we have been endeavoring for years, and with some success, to eliminate is openly encouraged. Overfeeding, underfeeding, between-meals feeding, unintelligent stimulation of the appetite, candy and sweet-eating in excess, all, are advocated by the selfish world of business in order to increase consumption. . . .

When we know that the sensible method of establishing a normal appetite is to keep food away until it is desired, our patients are advised to eat cat-soup to make the foods they 'like best taste better' and a brand of soups is advertised as 'your appetite's temptation.' Tonics, condiments and stimulating sauces are too commonly given to children because they are relished and because they increase food intake, and, in these days of undernourishment, justification is gladly found and the practice continued to the child's undoing."

The Business Side of the Doctor's Service—"From January 1, 1924," says a St. Louis doctor in a circular letter to his patients, "my practice will be on a business basis.

"I am compelled to pay office rent, drug bills, phone, light, gas, tires, etc., monthly and promptly. In consequence, I do not deem it just that I should render my services and supply drugs gratis or on an indefinite payment. Patients unable to pay, mentioning the fact, will be treated as promptly as before; those able to pay, and who do not, will oblige me by not calling me."

THE EVOLUTION OF ROENTGEN THERAPY IN HIGHER VOLTAGES *

By ALBERT SOILAND, M. D., Los Angeles

Two years have now elapsed since the present short-wave form of X-rays came into radiological favor in America, and it is now perhaps timely to venture some comments upon this theme.

For a great many years our most successful field of radiotherapy has been in lesions of the skin and subcutaneous tissues. For this work every conceivable type of electrical generator imaginable has been employed. Anything which would make a vacuum tube turn pink, blue, or green has been used with which to treat all ills that are the heritage of mankind. Little by little the pink and the blue tubes were placed in the discard, and gradually the intrepid radiologist essayed to delve deeply into the human anatomy, and finally succeeded in demonstrating beyond the possibility of a doubt that physiological and pathological response could be elicited upon structures below the body's exterior. Finally came some order out of chaos, and attempted measurements of all electrical factors entering into X-ray production brought forth a tabulation of units, destined to place Roentgen ray treatment upon a relatively scientific basis. From an uncertain and flickering voltage, giving rise to a phantom X-ray stream, there has come today a powerful generator with almost unbelievable capacity delivering through specially designed hot cathode tubes a force unseen and almost unknown, the remote effects of which we are all struggling to direct and understand. This progress, from our first feeble attempts to radiate the human skin surface to our present ability, to saturate the innermost recesses of the human body, has all been accomplished in the comparatively brief space of twenty-five years. You all know the many interesting periods of transition, of doubt, of struggles, of superstition—yes, even of death among some of our martyred pioneers—yet the science has emerged triumphant, and that which once eluded us is fast becoming our willing slave.

The present discussion will deal with the problems of deep therapy and the evolution of the higher voltages. We will, therefore, omit reference to skin and superficial radiation, and state briefly that it is now quite possible, by varying the factors of our operation, to inundate a desired depth field, with the knowledge that in this field a fairly constant effect of the energy of radiation may be obtained.

For the purpose of illustration, we may roughly state that, with a voltage of 200,000 at a 50 centimeter skin distance and with 10 millimeters of aluminum filter, effective radiation may be apparent four inches below the skin surface. With the same voltage and 15 millimeters of aluminum filter, an efficient but smaller amount of energy of radiation may be delivered six inches below the skin surface. With 20 millimeters of aluminum filter, a still smaller quantity of effective rays reach an eight-inch distance below the skin. This table is, of course, only relative, but it will serve to illustrate

* Presented to the Section on Radiology at the Fifty-second Annual Session of the California Medical Association, San Francisco, June, 1923.

the point. Rays which are not absorbed have no demonstrable action. It is only at the point of absorption that the ray gives off its energy; in other words, its corpuscular energy is dissipated with a subsequent cellular reaction, the termination of which usually results in a restored normal function.

It has been frequently stated that it did not appear logical to treat something six or eight inches below the surface of the body when the rays had to traverse so much normal tissue in order to reach the lesion, and that the intervening tissue must suffer by virtue of bearing the brunt of the attack.

While we are by no means agreed on the *modus operandi* of the X-ray stream, it has been demonstrated time and time again, both clinically and microscopically, that specialized cells, those of irregular formation such as the tumor type, are particularly susceptible to short-wave forms of radiation and that no appreciable lasting effect occurs in normal cells in dosage sufficiently heavy to transform completely those of pathological habit. Careful laboratory experiments and investigations have shown that only those rays which are absorbed by the tissues are capable of producing biological effects, and this knowledge has enabled the laying down of formulae which permit us to approach a therapeutic rationale.

It is to be regretted that many surgeons still look upon radiation as a rival, or something to be avoided. Surgery and radiation must work hand in hand, and one support the other in nearly all lesions which may be attacked with the prospect of cure. Surgery has reached a plane of perfection which is undeniable and which has, up to the present time, been the most acceptable method of treatment in many cases where other methods, including radiation, are failures. Yet one must admit that surgery is essentially limited to conditions where the necessity for mechanical interference or manipulation is permissible. On the other hand, radiation is a reactive process which cannot be considered mechanical in any sense of the word. It possesses properties which are reactionary, destructive, and reconstructive, acting on each individual cell in direct ratio to the inherent biochemic response and reactions of living protoplasm, and the effect of an erythema dose extends over a long period of time.

As a means of developing high voltage, the alternating current transformer, with either arms or disk, is still the instrument of general use. While this type of rectification is not ideal, it seems to have stood the test of time fairly well, the greatest drawback being the peak surge phenomenon, which is so disastrous to the life of the tubes. There is, under close investigation, the possibility of making available for Roentgen ray work a direct current generator, which, if successful, will simplify some of our present problems. Deep therapy will, in all probability, develop rather slowly and this is a point in its favor.

The problems connected with the purchase, installation, and use of a deep power plant are great enough to prohibit promiscuous broadcasting of such units. No one who is not thoroughly interested in the work will care to incur the expense and

responsibility of an adequate installation. While the monetary consideration of a deep therapy plant is of some concern, this sinks into insignificance when we contemplate the dangers associated with a live line of high voltage electrical stress, sufficient to destroy human life by a careless approach to the circuit. We have become so accustomed to play around our eight or ten-inch apparatus with impunity, ordinarily with no more serious results than a bad temporary shock or a small skin blister, that, unless our attention is sharply called to the new dangers, the consequences may be disastrous.

Up to the present, there is probably no pathological condition in existence that some enthusiastic radiologist has not attempted to treat, and while many of these attempts have been futile and the reason for their institution may have bordered on the ridiculous, yet the pertinent fact remains that radiology is daily enlarging its scope of usefulness. There is perhaps nothing in the entire therapeutic armamentarium which can approach, even in a small degree, the range of physiological action and reaction of the energy of radiation, and when we stop to contemplate the enormous scale of wave lengths at our command, of which we have as yet only fragmentary knowledge, our sober duty to this wonderful science becomes apparent. What the end-result of the investigation in our present-day high voltage work will be is not easily foretold. Refinement of technique, accuracy of dosage, greater care in our clinical and laboratory diagnoses, with a standardization of our individual efforts, will surely engender confidence and respect for this strictly medical specialty.

Can we, at this time, come to a conclusion as to the limit of useful voltage for generating short-wave X-rays? The writer believes that, with our present conception of the liberation of the energy of radiation, 300,000 volts would be sufficient for all purposes; in other words, all things being equal and with tubes constituted to functionate under a voltage of 300,000, the energy would be so enormous, both in quantity and quality, that to harness the useful stream in such an output would be difficult and perhaps dangerous. This statement is based purely upon the observation of the action of the daily serviceable voltage not in excess of 220,000. The writer ventures the opinion that a stream of short-wave electrons of more than 250,000 volts would, in many instances, overshoot the mark. If this is true, higher voltages are perhaps unnecessary. On the other hand, if, with a maintained tension of say 250 kilovolts, we were able to use amperage of high degree, so that the quantity of the stream could be substantially increased, it might be possible, substantially, to increase the beneficial effects of short-wave therapy. This procedure would also permit the simultaneous operation of a number of tubes limited only to the available capacity of the space in the laboratory and the demand for this type of work. The writer feels that it would be distinctly inadvisable, however, to attempt a shorter wave force of radiation until it has been thoroughly

demonstrated what the use and limitations of the present available output may be.

1407 South Hope Street.

DISCUSSION

Alanson Weeks, M. D. (350 Post, Street, San Francisco)—I remember ten years ago or more Howard Ruggles making the statement that, if ever a nineteen-inch spark gap could be procured, deep X-ray therapy would become a fact.

It has been my privilege since Rehfish installed the first deep power plant in this city at St. Luke's Hospital to watch the effects of such deep radiation treatment. The results are improving sufficiently to further the hope of future real usefulness. The actual destruction of the mucous membrane of the bowel when deep radiation is used for abdominal disease and the bad results of too much foreign protein being turned loose by overdosage have gradually lessened.

I trust I am speaking for all surgeons when I tell Soiland that there can be no question that surgery and radiation must work hand in hand, and that we surgeons will be grateful for the day when radiation or any other therapeutic measure shall take our place.

It is a charming thing to see a man so thoroughly wrapped up in his specialty, so modest in his claims for the same. He gives us much hope, but no false hopes.

Howard E. Ruggles, M. D. (135 Stockton Street, San Francisco)—Soiland has conservatively and completely stated the case for deep therapy as we know it at present. Further advances in this work will come with improved apparatus for which we are dependent upon the research laboratories of our universities and electric companies and with increasing experience in the application of our available equipment to a large amount of clinical material which must be carefully studied over a period of years.

The results so far are encouraging and occasionally brilliant.

Dr. Soiland (closing)—The discussion by Weeks and Ruggles is greatly appreciated, and it is a pleasure to know that they coincide with the thoughts expressed in the article.

My main object in presenting this theme before the section has been to make haste slowly in the deep voltage therapy; not to condemn because of damage alleged to have resulted from its use, neither to make extravagant claims for results, which time has not yet permitted us to definitely determine. There can be no question that short-wave X-rays are a distinct advancement in the field of radiation therapy.

A Valuable Manipulation for the Relief of Constipation—The procedure advocated by Herbert B. Whitney, Denver (Journal A. M. A., January 5, 1924), is applicable only to the evacuation of a fecal mass in the lower rectum, close to the anal sphincter, but hard to move because of its size, or density, or both. It consists in a remodeling of the mass by external digital pressure. Sitting in the usual posture at stool, the patient, with the second and third fingers of the left hand, carried down from behind, presses with the necessary degree of force on the thin and distended tissues between the coccyx and anus, and through this on the fecal mass directly beneath. The pressure exerted is not for the purpose of expelling the mass, but solely of changing its shape. As soon as this is accomplished, the usual abdominal pressure is quickly effective. The digital pressure must always be considerable, sometimes excessive; but even the latter is said to be both painless and harmless, and the ease and rapidity with which the favorable change of contour is effected, and evacuation follows, is often little short of marvelous.

THE ROLE OF ALKALIES IN TREATMENT *

By ANSTRUTHER DAVIDSON, M. D., Los Angeles

Nature's one object in life is to keep the blood stream pure, and the salts therein are kept in fixed proportions to that end. In the healthy individual the blood and tissues are alkaline, the chief salts Na. K. Cal. P. are all present in fixed quantities, and nature, in disease, draws from the food or tissues whatever is available to keep the tissues alkaline. When the tissues become acid throughout, death, as you know, ensues.

All the secretions, with one exception, are alkaline; all our excretions are acid. The one notable exception is the secretion of HCL by the stomach. It is usually presumed that HCL is secreted for the sole purpose of aiding the digestion of meat products, but that is only part of its functions. This acid is the medium whereby the Na, Cal, and other salts are rendered soluble and capable of absorption by the blood stream. Hyperchlorhydria, so familiar a feature in digestive troubles, is not the result of irritation; it is a compensatory process whereby nature seeks not only to eliminate the excess of acid in the blood, but attempts to dissolve more salts to neutralize that acidity and break the vicious circle already established.

In the formative period of youth hyperacidity is a serious factor. When the food is well balanced, of course, this does not occur. The chief causes of hyperacidity are the excessive use of carbohydrates and sugars. When acidity of tissues destroys the alkaline balance of the blood, sickness is prone to supervene. The administration of alkalies in fevers and catarrhal inflammations was established empirically ages ago. The standard remedies of our predecessors were citrate of potash and liquor ammonia acetatis or some such alkali, and I know of no better now, though I think the tendency of many practitioners is to prescribe sedatives and antipyretics.

There is no more certain method of aborting an acute coryza than by administering bicarbonate of soda in large doses on the first indication of an attack. In the late influenza epidemic, I have every reason to believe, from my observation and experience, that those individuals who daily took enough soda to render the urine alkaline nearly invariably escaped the disease. At one time two of my students who invariably suffered from poison oak tried the experiment of keeping their urine alkaline when on mountain trips, and for the first time were able to return unaffected. Acidity of the tissues seems to make them more vulnerable, the alkalies restore the blood to normal and thereby increases their vital resistance. During the war many soldiers suffered from severe form of seborrheic eczema that proved quite resistant to ordinary remedies. One medical officer succeeded in curing these cases by the administration of alkalies. Sodium bicarbonate was most commonly used, but in some cases one pound a day of this was given without altering the reaction of the urine. In such instances, one can usually alkalize the urine with the fixed carbonates. Soda has

* Read before the Los Angeles County Medical Association November 1, 1923.